

# Personal Control and Disordered Eating in Female Adolescents With Type 1 Diabetes

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**OBJECTIVE** — The onset and subsequent management of diabetes can challenge one's sense of control. Sense of control can also be affected by the biological changes accompanying normal pubertal development. The negative impact on one's sense of control may be further exacerbated when both events (i.e., diabetes and puberty) occur in relatively close temporal proximity.

**RESEARCH DESIGN AND METHODS** — This study examined the relationship between sense of control and disordered eating and glycemic control in 45 female adolescents with type 1 diabetes.

**RESULTS** — A lower sense of overall control and a lower sense of bodily control were both directly related to more severe eating-disordered symptoms. However, a lower sense of overall control and lower bodily control were related to poorer metabolic control primarily when the diagnosis of diabetes occurred closer to the onset of puberty.

**CONCLUSIONS** — Clinicians should assess and monitor perceptions of control and also consider the temporal proximity of disease onset and onset of puberty when managing type 1 diabetes in female adolescents.

*Diabetes Care* 25:1987–1991, 2002

Clinical eating disorders are estimated to affect 1–3% of females in the general population (1). Although the prevalence of clinical eating disorders in females with type 1 diabetes varies, sub-clinical eating disorders may be elevated in this population (2,3). The sequelae of disordered eating in the general population can be severe; in type 1 diabetes disordered eating behaviors can impair metabolic control and increase the risk for diabetic complications (2). Additionally, diabetes patients have access to a unique method for controlling their weight, namely, omission of insulin.

Many variables have been hypothesized to account for the relationship be-

tween type 1 diabetes and eating disorders: feelings of body dissatisfaction; wishing to lose weight because of insulin-related weight gain; feeling obsessed with food; feeling out of control; believing that diabetes is controlling one's life; and experiencing increased independence/dependence conflicts. Although these individual difference variables have been discussed in the literature, empirical support for most of these hypotheses is lacking.

One specific personality construct that has been investigated in eating disordered females is personal control. Personal control can be defined as "the ability to cause an effect in the intended direc-

tion," and a sense of personal control as a "measure of a person's view that they have control, as well as the belief that they could gain control if they wished" (4,5). Personal control plays a critical role in a variety of motivational, behavioral, and emotional processes (6,7). A sense of control is associated with positive psychological and physical health; perceived lack of control is associated with morbidity and psychopathology (4,5,8,9).

Research in the general population provides some support for the role of personal control problems in the etiology of disordered eating. Personal control has been found to differentiate eating disordered patients from a normal comparison group (5). Specifically, a reduced sense of control has been identified in eating disordered patients (5). Furthermore, eating disordered individuals described themselves as showing excessive self-control and aggression as well as being overcontrolling (5).

Feminist psychoanalytic formulations of eating disorders have also focused on personal control. It has been proposed that by controlling what goes in and out of the body, women attempt to master that which feels uncontrollable. Thus, dieting or weight control may help to attenuate aspects of life that appear to be out of one's control (10). Moreover, eating-disordered behaviors may offer a unique opportunity to strengthen a sense of control in areas that have been regularly experienced as controlled by others. Despite its intuitive appeal, support for this perspective remains anecdotal and is not easily testable.

To our knowledge, only one study to date has specifically examined the relationship between personal control, as defined above, and metabolic control (i.e., HbA<sub>1c</sub>) in individuals with type 1 diabetes. Surgenor et al. (11) observed that adult women with optimal metabolic control had a greater sense of personal control than those with poor metabolic control. Participants with optimal metabolic control also reported a greater sense of personal control over their body versus those

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Received for publication 16 February 2002 and accepted in revised form 30 July 2002.

**Abbreviations:** EDE-Q, Eating Disorder Examination Questionnaire; SCI, Shapiro Control Inventory.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

with poor metabolic control. Moreover, participants with poor metabolic control acknowledged a strong desire for personal control, despite having a lowered sense of personal control.

Further evidence for the important role of personal control derives from a study by Maclean (12), who characterized patients' adherence to a diabetic diet on a continuum ranging from strict to minimal adherence. Individuals failing to adhere to the dietary regimen described themselves as miserably obsessed with food and reported feeling angry, resentful, and out of control. Moreover, these individuals felt victimized, believing that diabetes was controlling their life, not that they were in control over their diabetes.

In general, adolescence is a time when conflicts over control and independence are paramount. Research suggests that fear about gaining weight, concerns about body shape, and an increased sensitivity to diet are risk factors for disordered eating, particularly during puberty (13). During puberty, girls experience an increase in hip growth along with a general increase in body fat, particularly in the upper legs, as they cease to gain height (14).

It has been suggested that the diagnosis of type 1 diabetes may further intensify the typical conflicts over control and independence that occur during adolescence. In young diabetic women, struggles with personal control may be further exacerbated by biological changes accompanying the onset of puberty. For children with established diabetes who are entering adolescence, there is a natural and often quite rapid increase in insulin requirements (15). As a result, achieving glycemic control often becomes more challenging at the onset of puberty (16). In addition to physiological disturbances, the privacy of the adolescent is invaded with frequent exams to chart progress of pubertal development, and there may be increased conflict between adolescents and their parents about the diabetes regimen (17). Adolescents may feel that the necessary changes, requirements, and responsibilities that go along with type 1 diabetes are controlling their lives.

Both the diagnosis of type 1 diabetes and the onset of puberty can be viewed as events that disrupt feelings of control. Presumably, the diagnosis of type 1 diabetes, combined with the experience of

puberty and adolescence, could exacerbate conflicts for independence and autonomy and hence lead to an even greater desire for control and independence. The focus on weight and appearance, common to adolescence, is magnified for teens with diabetes. Insulin-related weight gain may further contribute to the female teen feeling as if she does not have control over her own body. Thus, for the female adolescent with type 1 diabetes, the possibility of needing to control one's weight as a reaction to the inability to control important areas in her life may be particularly relevant.

### Research hypotheses

An empirical investigation is needed to identify and better understand the conditions under which personal control may contribute to the development of disordered eating behaviors and poor metabolic control in adolescents with type 1 diabetes. In the present study, three aspects of personal control were examined: overall sense of control, desire for control, and sense of control over one's body. In general, it was proposed that personal control (i.e., need for control, sense of control, bodily control) would be related to disordered eating and poor metabolic control (i.e., HbA<sub>1c</sub>). However, it is expected that these relationships would be moderated by pubertal status at the time of diabetes diagnosis. Thus, when adolescents are diagnosed with diabetes closer to puberty, a greater desire for control as well as a lowered sense of overall control and a lowered sense of bodily control would each predict 1) more severe eating disorder symptoms and 2) poorer metabolic control.

## RESEARCH DESIGN AND METHODS

### Subjects

Female adolescents with type 1 diabetes, aged 12–18 years, were recruited from the diabetes clinics at major medical centers in Illinois and Georgia. Eligibility for the study included the diagnosis of type 1 diabetes for at least 1 year and literacy and fluency in English. The presence of another major medical diagnosis was an exclusion criterion. Of the 106 adolescents approached or considered for participation, 53 completed the study. Of the remaining 53, 19 chose not to participate and 34 did not meet inclusion criteria.

### Procedures

Parents were contacted by telephone before their child's clinic appointment. At this appointment, parents and adolescents completed consent and assent forms, and in a quiet area, study participants completed self-report questionnaires. Mothers completed a demographic information form and provided information regarding their daughters' menstruation status and, if appropriate, the age of menarche. This information provided a marker for puberty.

Adolescents completed the Eating Disorder Examination Questionnaire (EDE-Q) (18), a 38-item self-report measure of the specific psychopathology of eating disorders. The EDE-Q consists of four subscales: restraint, eating concern, shape concern, and weight concern. A total EDE-Q score was computed by adding together the four subscale scores. Adolescents also completed the Shapiro Control Inventory (SCI) (19), a 9-scale, 187-item self-report questionnaire. The SCI measures several aspects of control, but in the present study, only the following three subscales were examined: overall sense of control, desire for control, and domain-specific bodily control scales. Metabolic control was measured using HbA<sub>1c</sub> levels, representing the mean glucose concentrations over the preceding 8–12 weeks. The HbA<sub>1c</sub> level from the most recent clinic appointment (typically within the past month) was obtained from each patient's chart.

### Statistical analyses

Analyses were run using SPSS Software (20). The significance level for all analyses was set at  $P < 0.05$ . Zero-order correlations were performed using Pearson correlations.

Moderator models were examined using multiple linear hierarchical regression. Specifically, the experimental hypotheses were evaluated by examining the differential effect of an independent variable on a dependent variable as a function of a moderator variable. Before examining moderator models, zero-order correlations between independent and dependent variables were examined, and if significant relationships were observed, moderator models were not examined. To assess the effect of the moderator on the relationship between the predictor and the dependent variable, an interaction term was constructed. When significant

Table 1—Regression analyses predicting eating disorder symptoms and metabolic control

	R <sup>2</sup> change	Standardized $\beta$
Eating disorder symptoms		
Desire for control	0.02	0.13
Pubertal status	0.01	-0.12
Interaction	0.08	-2.09
Overall F(3,41) = 1.73		
Metabolic control		
Sense of control	0.04	-0.20
Pubertal status	0.02	-0.16
Interaction	0.13*	2.93
Overall F(3,41) = 3.28*		
Desire for control	0.01	-0.12
Pubertal status	0.03	-0.16
Interaction	0.07	1.89
Overall F(3,41) = 1.62		
Body control	0.03	-0.17
Pubertal status	0.03	-0.17
Interaction	0.18†	2.35
Overall F(3,40) = 4.21*		

\* $P < 0.05$ , † $P < 0.01$ .

interactions were found, simple effects were examined. To analyze simple effects, two subgroups were formed and separate Pearson product moment correlations between the predictor and the dependent variable were conducted within each subgroup. The difference between the strength of the correlations in each subgroup was tested using Fisher's  $z_r$  transformation.

**RESULTS** — A total of 53 subjects participated in the study, 35 patients from Illinois and 18 from Georgia. The settings at both locations were pediatric endocrinology departments in major medical centers. Ages ranged from 12 to 18 years (mean  $\pm$  SD, 14.4  $\pm$  1.72); 70% were Caucasian. Age at diagnosis of diabetes ranged from 1 to 13 years (9.01  $\pm$  2.83). Age at menarche ranged from 10 to 16 years (12.18  $\pm$  1.37). To examine the proximity of the diabetes diagnosis to the onset of menarche, a difference score was computed. Age at diabetes diagnosis was subtracted from age at menarche, and the absolute value was calculated. The resulting number reflected the temporal proximity of puberty to the diagnosis of diabetes.

Seven adolescents had not yet reached menarche and were not included in the analyses. One subject did not complete the SCI. Thus, a total of 45 subjects were included in the analyses. One sub-

ject did not complete questions on sense of body control; thus analyses including that variable are based on 44 subjects.

The average total score on the EDE-Q was 2.03  $\pm$  1.51, and the average HbA<sub>1c</sub> value was 9.57  $\pm$  1.81%. Total scores on the EDE-Q were not correlated with values of HbA<sub>1c</sub>, [ $r(44) = -0.05$ ,  $P = 0.73$ ]. The average overall sense of control score was 86.11  $\pm$  16.37; desire for control was 48.51  $\pm$  9.72; and sense of body control was 21.77  $\pm$  6.63. The average number of years between diabetes diagnosis and puberty was 3.48  $\pm$  3.20. Zero-order correlations revealed that a lower sense of overall control was associated with more eating disorder symptoms [ $r(44) = -0.56$ ,  $P < 0.001$ ]. Similarly, a lower sense of control over one's body was also associated with more eating disorder symptoms [ $r(43) = -0.62$ ,  $P < 0.001$ ].

#### Overall personal control

The results for all regression models are reported in Table 1. Less overall personal control was associated with more severe eating disorder symptoms; however, pubertal status did not moderate this relationship. There was a trend for less sense of overall control being associated with poorer metabolic control ( $P = 0.06$ ). The hypothesis that pubertal status moderates the relationship between overall sense of control and metabolic control was supported ( $R^2$  change = 0.13,  $P < 0.05$ ), as

revealed by the significant interaction term.

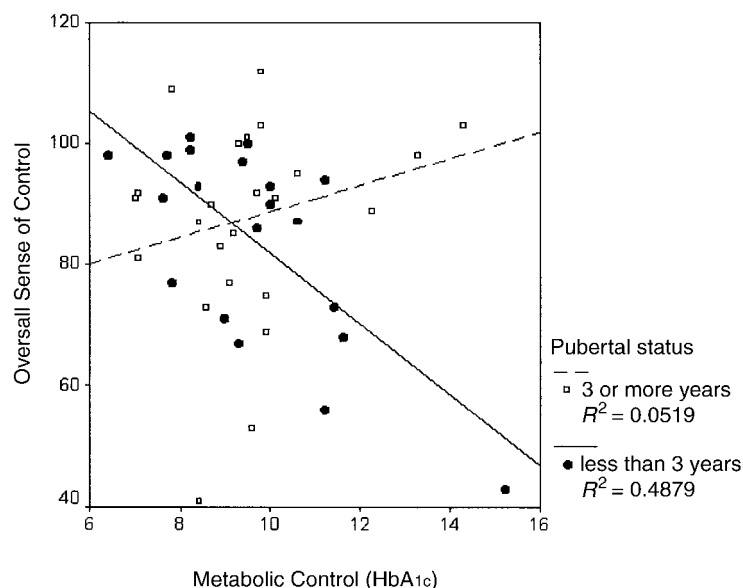
In examining simple effects, a median split was performed on the pubertal status variable. The resulting subgroups were composed of individuals diagnosed <3 years ( $n = 21$ ) from menarche compared with those diagnosed  $\geq 3$  years from menarche ( $n = 24$ ). Overall sense of control was not associated with metabolic control when adolescents had been diagnosed  $\geq 3$  years from puberty [ $r(23) = 0.22$ ,  $P = 0.15$ ]; however, a lower overall sense of control was associated with poorer metabolic control when adolescents had been diagnosed <3 years from puberty [ $r(20) = -0.69$ ,  $P < 0.001$ ]. Thus, the hypothesis that a weaker sense of overall control would lead to poorer metabolic control when an individual was diagnosed with diabetes closer to puberty was supported (Fig. 1). The difference in the strength of the correlations between groups was significant ( $z = 3.35$ ,  $P < 0.01$ ).

#### Bodily control

A weaker sense of control over one's body was associated with more severe eating disorder symptoms; however, pubertal status did not moderate this relationship. No significant main effects were observed with metabolic control as the dependent variable. However, the hypothesis that pubertal status moderates the relationship between sense of body control and metabolic control was supported ( $R^2$  change = 0.18,  $P < 0.01$ ). Sense of control over one's body was not associated with metabolic control when adolescents were diagnosed three or more years from puberty [ $r(23) = 0.20$ ,  $P = 0.18$ ]; however, weaker sense of control over one's body was associated with poorer metabolic control when adolescents had been diagnosed <3 years from puberty [ $r(19) = -0.66$ ,  $P < 0.01$ ]. Thus, the hypothesis that a weaker sense of control over one's body would lead to poorer metabolic control when an individual was diagnosed with diabetes closer to puberty was supported (Fig. 2). The correlations between these two groups differed significantly in strength ( $z = 3.06$ ,  $P < 0.01$ ).

#### Desire for control

Whereas desire for control did not predict eating disorder symptoms or metabolic control, there was a trend for pubertal status to moderate the relationship between



**Figure 1**—Relationship between overall sense of control and metabolic control as moderated by pubertal status.

desire for control and eating disorder symptoms ( $P = 0.06$ ).

Statistical analyses were conducted to examine if any demographic variables accounted for our results. None of the above findings were confounded by demographic variables (e.g., race, age, and parents' marital status).

**CONCLUSIONS**— The primary purpose of this study was to examine the association of perceived personal control with disordered eating behaviors and with metabolic control in female adolescents with type 1 diabetes. Main effects were observed between two of the personal control variables and disordered eating. Specifically, adolescents experiencing a lower sense of overall control and a lower sense of control over their body reported more severe eating disorder symptoms. These relationships were independent of the proximity of diagnosis to puberty. However, proximity of the diagnosis of diabetes to the onset of puberty moderated the relationship between an adolescent's overall sense of control and metabolic control and between an adolescent's sense of bodily control and metabolic control. More specifically, having a lower overall sense of control and having a lower sense of control over one's body were related to poorer metabolic control when an adolescent was diagnosed with diabetes closer to puberty (i.e., within a 3-year period).

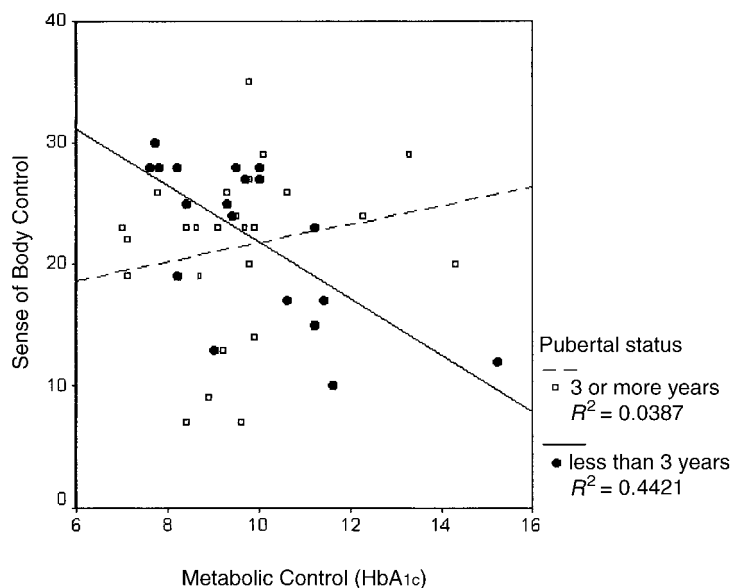
Our study supported the finding of Shapiro et al. (9) of a relationship between overall sense of control and disordered eating, but we did not find this relationship with desire for control. Furthermore, unlike Surgenor et al. (11), who examined adults with type 1 diabetes, we did not find a direct relationship between overall control, bodily control, and metabolic levels. Rather, we found that only when the diagnosis of diabetes was relatively close to puberty did weaker control

correlate with poorer metabolic levels. Thus, it is possible that the relationship between personal control and metabolic control is different for adolescents than for adults. Our findings are based on the assumption that both the diagnosis of type 1 diabetes and the onset of puberty are viewed as events that disrupt feelings of control.

It is unclear why the desire for control, unlike other aspects of control, failed to predict either eating disorders or metabolic levels. It may be helpful to observe that the desire for control was not correlated either with the overall sense of control ( $r = 0.18$ ,  $P = 0.21$ ) or with control over one's body ( $r = 0.25$ ,  $P = 0.08$ ). This differential correlational pattern could be attributed to the possibility that although patients may strive to adhere to their diabetes regimen to obtain good metabolic control, the desire for control may not necessarily result in optimal metabolic control. Thus, although desire for control may be important, it may be the individual's perception of how much control they have that is ultimately more important.

There are also several limitations to the present study. First, our sample size is relatively small. Additionally, we did not obtain demographic data on those patients who chose not to participate in the study, making it difficult to assess the representativeness of the sample.

Overall, our findings suggest that it is



**Figure 2**—Relationship between sense of bodily control and metabolic control as moderated by pubertal status.

especially important to address issues of control and independence in the adolescent with diabetes, particularly when the diagnosis of diabetes occurs close to puberty. For the female adolescent with type 1 diabetes, the possibility of needing to control her weight as a reaction to the inability to control important issues in her life may be particularly relevant. If we view the diagnosis and management of type 1 diabetes as a stressor in the adolescents' life, then the inherent focus on food and weight that is a part of the care of diabetes may be an important factor in understanding and changing the relationship between personal control and the onset of an eating disorder.

Because issues of personal control may contribute to disordered eating and poor metabolic control in female adolescents with type 1 diabetes, the present findings have some relevance for enhancing treatment effectiveness. Many diabetes clinics have a mental health professional as part of their multidisciplinary treatment team. Such an individual can either routinely evaluate all newly diagnosed female adolescents attending the clinic or evaluate only those patients who have been identified through screening instruments as being at greater risk for disordered eating or as having a greater need for personal control. Furthermore, patients with elevated HbA<sub>1c</sub> values could be referred for further evaluation to determine whether these elevations are due to disordered eating behaviors or concerns regarding personal control.

In conclusion, assessing and recognizing the importance of personal control could help clinicians, especially at the time of diagnosis, to identify young females who may be at risk for developing disordered eating or problematic meta-

bolic control, particularly as they near the time of puberty.

**Acknowledgments**— We greatly appreciate the assistance and guidance of William Hoffman, MD, and Christian Lemmon, PhD. We thank Beth Glenn, PhD, and Jamie Grollman, MS, for their assistance in data collection. We also greatly appreciate the efforts of Betty Pries, MSN, PNP, and Janice Greene in subject recruitment.

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